An Address

ON

HUMAN ANATOMY IN ENGLAND DURING THE NINETEENTH CENTURY

Delivered to the Students of the London Hospital

BY

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GENTLEMEN,—In the opinion of the great majority of medical men the subject of human anatomy, so far as it can serve the purposes of the physician and surgeon, has become in our time as perfect as the skill of man can make it. I will not venture to say that such an opinion is unreasonable. The human body is a comparatively small and strictly circumscribed field wherein generation after generation of anatomists have laboured during many centuries, treasuring and perpetuating their observations in an almost endless series of tomes. If finality be possible we ought now to have reached it. One who believes that the stage of perfection has been reached might cite our modern text-books of anatomy as evidence; they seem to leave nothing further to be desired; their bulk ought to betoken finality. Never before has the structure of the body been displayed so exhaustively, so accurately, or so temptingly as to the young man who commences the study of medicine to-day. But unfortunately the condition of a subject, its perfection or imperfection, cannot be measured by an examination of its text-books. As regards human anatomy it can be judged only by seeing how well it serves the needs of medical men, and when modern anatomy is measured by this standard it seems to me to fall very far short of perfection.

To make my meaning clear, let me cite a number of structures on which anatomists, physicians, and especially surgeons have concentrated their most strenuous endeavours during the last two or three decades. I will select the appendix vermiformis as my first instance. Its size, shape,

position, variations, and development are described in the most elaborate detail, but nowhere can one find answers to these questions: Why is its lumen so small, its muscular coat so thick, and its supply of lymphoid tissue so abundant? Why does it, like the thymus, tonsil, Peyer's patches, and lymphoid structures generally tend to undergo an atrophy with age? Yet the answers to these questions seem to me to constitute the very essence of the anatomy of the appendix. Could the anatomist answer these, then indeed we should know something of its nature. To call the appendix a "vestigial structure" or a "cæcal tonsil" is merely a manner of covering our ignorance of its nature by a gloss of knowledge—a very remarkable thing in the case of a structure that causes the death of thousands of persons. The great intestine will serve as another instance. It has been most minutely described and demarcated into segments; its fixation, its tæniæ, its form, and course are set forth in our text-books at great length. But no one asks why it is so placed and fixed, why its outer muscular coat is gronped in tæniæ, or why it takes such a remarkable and tortnons course. Certainly the theory of its being a nseless structnre and a cesspool, promulgated by Metchnikoff and accepted by so many, will not assist us in explaining the significance of these features. Many other structures might be cited, such as the gall-bladder, the prostate, the epididymis, the antrum of the mastoid, the nasal air sinnses, the semilunar cartilages of the knee, the erector spinæ, or the folds and arrangement of the peritoneum. On each one of these structures anatomists and surgeons have focussed their attention of late years with the resnlt that we have accumnlated an enormous catalogue of their physical characters, bnt of their nature, meaning, or function little or nothing. That a generation of medical men in seeking to establish a scientific basis on which to apply treatment should rest content with merely describing the physical characters of parts which are so often the seat of disease seems to me a very remarkable defect in our modern methods of anatomical inqniry. This grave defect I believe to be a direct resnlt of the modern conception of human anatomy.

What is our modern conception of human anatomy? If you turn to examination papers you will find it; most of the questions begin with the word "describe." Turn to our text-books and you will find that such and such a part "presents for description or examination the following features" as if the main reason for the very existence of the

part was for "the purposes of description." Our anatomical text-books are what they claim to he—works on "descriptive" anatomy. The art of description has become the chief pnrpose of anatomy. We describe to yon the heart in its utmost details—its shape, surfaces, borders, and grooves; we treat it as a still-life study, a thing of crests and angles so utterly unlike the palpitating organ you afterwards have to place your stethoscope over that you cannot imagine the anatomical and clinical heart to be the same thing. In my student days two hooks on anatomy were held up for particular commendation; one was Ward's "Osteology," the other Ellis's "Anatomy" (now in my opinion much improved). Both are magnificent examples of accurate and painstaking observation and description. If anatomy he hut the correct description of parts, then, indeed, our subject has reached a finality. To my mind the apparent futility and barrenness which characterise so much of our modern anatomical work are due to the fact that this *descriptive* ideal has heen accepted and that the business of the anatomist is to describe appearances, not to explain them.

The remarkable story of how anatomy came to be regarded in England as a "descriptive science" commences towards the close of the eighteenth century. In the latter part of that century British anatomists were, as indeed they had always heen, much more than mere describers. John Hunter in London and Alexander Monro (secnndus) in Edinburgh had modelled themselves on the prototype of English anatomists, William Harvey. In no sense was Harvey a descriptive anatomist: he studied the human hody to understand the significance, not the form of the various parts. He perceived that the hypotheses of his time did not account for the structnre of the heart nor for the arrangement of its blood-vessels. It was to explain these that he postulated the theory of the circulation of the blood, the truth of which he afterwards proved by experiment. It was in the same spirit that Hunter, Monro, and the two Bells pursued the study of anatomy in England in the later decades of the eighteenth century. To Hunter the observation of a fact was hut the prelude to an attempt to explain its significance. It was not enough to record that the wall of the aorta was twice as thick as that of the pulmonary artery or that the walls of some veins were thick and of others thin: he immediately set to work to find out the significance of these facts; he appealed to comparative anatomy, to embryology, to pathology, and experiment for

an explanation. Monro formed a true conception of the manner in which the cerebral circulation was carried on from a consideration of the anatomy of the parts; he did not rest content with merely describing the venous sinuses within the skull but sought for the reason why the larger intracranial veins assume such a peculiar form. In the "System of Dissections" by Charles Bell,[1] and in the text-book first issued in 1793 by John and Charles Bell, one sees the same spirit at work. Thus, up to the end of the eighteenth century there was a strong school of British anatomists who regarded dissecting as a means for obtaining not a description but an understanding of the human body. By the end of the second decade of the nineteenth century this robust British school had almost ceased to exist, its extinction being due to the introduction of a French fashion. At that time our young men turned to Paris for their medical ideals, just as now our young women seek there the standard of fashion. Our young anatomists preferred the clear, methodical descriptive manner of the Parisian school to the heavier methods of their predecessors. Descriptive anatomy had thriven amazingly in the French schools. It was the creation, I think, of the famous Winslow, professor of anatomy, physic, and surgery in the University of Paris, in the middle decades of the eighteenth century. He had (but to a very high degree) that gift which many of his countrymen still retain of engaging the rapt attention of his readers and hearers by the sheer lucidity and orderliness of his descriptions. While merely conveying to his hearers or readers what they might see with their own eyes at a glance he left with them the pleasant impression that they were drinking at the very fountain-head of pure knowledge. This special gift of vivid description has often deluded scholars into mistaking the shadow for the substance. A system of knowledge which settles home too easily in one's understanding is just the knowledge to be accepted with scrutiny. Winslow purposely abstained from attempting to explain the meaning of the structures which he described, proposing to relegate all that related to function to another volume. In so doing he emasculated anatomy; but the system he initiated prospered abundantly, and at the end of the eighteenth century, in the hands of his able follower Bichat, it came to be regarded, in France at least, as the ideal conception of anatomy.

[1] Edinburgh, 1798.

In the opening years of the nineteenth century we can see the French influence at work in the British schools. In 1804 and 1807 appeared Sir Astley Cooper's famous folios on Hernia. They differ totally in spirit from the anatomical works of the previous age—those of Hunter and Monro. They are minute, elaborate, and rather irksomely accurate descriptions of parts; he never stops to ask why the parts are so arranged but is content to have described them. The "London Dissector," a popular guide in the dissecting-room during the earlier part of last century, is a purely descriptive work with the merit of brevity. The "Dublin Dissector" is unmistakeably founded on the teaching of Bichat. When in 1828 Jones Quain published the first edition of that famous work, which has had many rivals but, in my opinion, no equal, he quotes with commendation the system of description enunciated by Béclard—namely, that in dealing with a structure the following order should be observed: (1) form and outline; (2) situation and relationship; (3) direction of its axis; (4) size; (5) physical characters; (6) anatomical composition; (7) chemical composition; (8) secretions; (9) properties during life; (10) vital action; (11) sex and age change; and (12) morbid changes. Béclard's is certainly a comprehensive formula, but still it is a formula, and nothing is more certain than that the introduction of a formula into any system of knowledge whatsoever means a cessation of all rational endeavour in that system. But to see with what avidity the conception of anatomy as a "descriptive science" was accepted in Britain one must turn to the writings of that ill-starred whirlwind, the brilliant anatomical demagogue, Robert Knox of Edinburgh. It seized him with all the force of a revelation; in season and out of season, by translation of French treatises and popular lectures, he preached the adoption of the methods and ideals of Bichat and Cuvier as the salvation of British anatomy. If other British anatomists adopted these ideals more quietly than Knox they were nevertheless sound converts and by the middle of the nineteenth century we see the French formularies brought to perfection in the hands of Ward and Ellis. Throughout the whole of the nineteenth century British anatomists built on the plan designed by the French anatomists of the eighteenth century. That this plan has provided a sound foundation for the accumulation and systematisation of anatomical fact no one can deny who is familiar with our magnificent modern text-books, wherein, at a length of some 800,000 or 900,000 words, the medical

student is presented with an exhaustive description of the *dead* human body. If we had remained true to the ideals of the earlier British anatomists they would have portrayed a picture of the *living* human body.

While the general trend of anatomy in this country during the nineteenth century was mainly determined by the acceptance of the French ideals, yet even a brief account would be altogether misleading unless other influences are noted which came to bear on British anatomists and determined the direction of their observations. In the opening decades of the nineteenth century Cuvier's influence was profound. He had demonstrated to all the world that anatomy provided the data by which the members of the animal kingdom might be arranged in a natural and orderly system of groups. Anatomy, which had been the humble utilitarian drudge of medical men, was promoted to be the handmaid of men whose aim was pure science. Human anatomists gladly forsook the task of trying to discover the mechanism of the human body and set out on the high task of setting the animal kingdom in order. The methods of descriptive anatomy, however imperfectly they may answer the purposes of medical men, were admirably adapted for the needs of the comparative anatomist. Owen became the first effective exponent of the Cuvierian school in England and I know of no finer irony in fate than that the Hunterian collection which the eighteenth century master had built up to elucidate the contrivance of the human body in particular and the organisation of living things in general, should have been placed in the hands of one who, however brilliant his powers of description, was a believer in archetypes rather than in function. Owen's fame and name were great, and if he exercised no direct effect on the body of knowledge which we call human anatomy, yet one can see that from 1830 onwards he gave many anatomists a bent towards vertebrate morphology, and thus to some degree modified the undercurrent of our anatomical text

There is a very remarkable parallelism between the three men who dominated anatomical work in France during the earlier decades of the nineteenth century and the three men who exercised a similar influence in England during the great Victorian period. Cuvier was accompanied by two men, Etienne Geoffroy St. Hilaire and Lamarck. They were interpreters of fact, and Cuvier, a describer and classifier, used his predominating influence to suppress them. Owen was also accompanied by two interpreters of fact ; in place of Geoffroy St. Hilaire stands Huxley, in place of Lamarck, Darwin, but

in England it was the interpreters of fact who proved victorious. Darwin and Huxley had a profonnd influence on the work of British anatomists ; they brought them back to the study of thc human body ; evolution provided a key to many structures which puzzled the human anatomist. But while man's position in the animal world was being determined with great success his place in the medical world was well-nigh forgotten.

In the last three decades of the nineteenth century a movement in a new direction became general amongst anatomists. The development of the body became more and morc a subject of investigation. In this movement the late Professor His exercised a predominating influence ; it was patent to all that the reconstructional and modelling methods which he employed with consummate skill provided the material for the foundation of a sound and progressive system of knowledge. In the main His was a descriptive embryologist ; he carried the ideals current amongst anatomists of his time into a new field of work. Far be it from me to deprecate the value of descriptive work in embryology or anatomy ; only I would most strenuously urge, what is so frequently forgotten, that description is only the beginning, not the end, of all embryological and anatomical investigation.

Thus it comes to pass that a yonng man commencing the stndy of medicine in 1907, although he may obtain a truer conception of " Man's Place in Nature " and a fuller knowledge of the development of the human body than was possible for his predecessor of 1807, yet holds little or no advantage over him as regards the available stock of practical anatomical knowledge. For proof of what I maintain one may turn to the account of the heart, that organ which in all times has been accounted the most important in the study and practice of medicine, given in Bichat's " Traité d'Anatomie Descriptive "[2] and compare it with the descriptions given in the latest editions of our modern text-book of anatomy and it will be found that, as far as concerns the naked eye anatomy of the heart, the one account differs very little from the other ; indeed, if anything, the older book gives the better working picture of the heart. The same parts are enumerated and described ; in the right auricle, for instance, the student is asked to observe the openings of the superior and inferior vena cava, but in neither the old

[2] Paris, 1803,

work nor the new is any mention made of the arrangement of the musculature round these orifices, the student apparently being expected to presume that they are always open. Bichat, it is true, describes a rounded band of musculature in the right auricle crossing in front of the superior caval orifice but of its significance says nothing. In modern text-books this same band is described as a crest—the crista terminalis, the very name showing how far anatomists have lost sight of function when they name a contracting band of muscle a crest. From the physiologist the modern student learns that these orifices are closed during auricular systole by the surrounding circular musculature, but when he comes to examine the human heart he will find that there is no circular musculature round the inferior caval orifice, while he will find it difficult to believe that the muscle round the upper orifice is sufficient for the task ascribed to it.

Having compared the best of the early nineteenth century with the best of the early twentieth century anatomies, let us turn to the account in the last of the truly British text-hooks, Bells' "Anatomy of the Human Body." From an examination of the parts the anatomist there infers that neither orifice can be closed ; that they are always open, in systole and diastole ; and that regurgitation of blood during the contraction of the auricle is prevented by the pressure in the veins being normally greater than the diastolic pressure in the right ventricle. I am now convinced that, as far as concerns the inferior caval orifice, John Bell's conception is true, and I am not so certain as I was that the band of muscle above mentioned—the tænia terminalis—is absolutely sufficient to occlude the upper orifice in man, although there can be no doubt from its arrangement that it does diminish it in auricular systole. Within the right auricle, too, turning again to modern text-hooks, the student is expected to examine the tubercle of Lower which is believed to direct the current of blood flowing in from the inferior vena cava—a miniature breakwater. Bichat expresses a douht as to the tubercle ; he speaks of it as the "tubercle which Lower saw or believed he saw." Bell expresses a more definite doubt. "It is commonly absent," he states, and adds "if it were not really an imagination of that celebrated anatomist." Now, what Lower represents in the figure showing this "tubercle" is the heart of the calf or sheep, in which the upper and lower venæ cavæ enter the right auricle close together and set at a

fairly acute angle to each other, so that the hand of mnscle hetween their orifices is very apparent on the interior of the auricle. It was to this intercaval hand of muscle which Lower gave the name of tubercle, a term inappropriate in the sheep's heart and altogether inapplicahle to the human heart.

Many further instances might he cited to show how far the adoption of the descriptive method has ohscured our real ohject in studying the anatomy of the heart. I will refer to only one—namely, the structures concerned in tricuspid regurgitation All of ns who now teach human anatomy must have heen familiar as students with the clinical doctrine that under certain conditions the tricuspid valve became incompetent. Yet, in our puhlished descriptions we never ask the student to look beyond the cusps of the valve and the fibrous ring—a very delicate ring it is—which surrounds the orifice as the means of securing competency. The relationship of the musculature at the hase of the right ventricle to this orifice and the effect of its contraction on the size of the orifice were scarcely mentioned, yet from a clinical point of view the surrounding musculature is infinitely more important than the surrounding fibrons ring. In spite of the teaching and discoveries of embryology we still confuse nnder the term "base" two totally different parts of the heart—namely, the commencement and end of the cardiac tuhe. The conical shape of the heart—its apex and hase—we assnme as axiomatic and incapable of explanation. We describe the walls of its chambers as if they were rigid, overlooking the fact that they are composed of a pulsating musculature arranged so as to prodnce definite movements hy which their contents are propelled.

So far my argnment has been to show that our progress in real practical human anatomy during the nineteenth century has not been so great as is generally supposed, the lack of progress being dne in the first place to our acceptation of "descriptive" anatomy as the real anatomy, and, in the second place, hecause side issues have heen allowed to draw anatomists away from their real work. But it might he nrged that the defects I see in modern anatomy are the result of the separation from it of physiology—a separation necessitated by the growth of knowledge. That a separation was necessary I fully admit, hut that the dividing line should have heen drawn where we now find it has proved, as I have just shown, a great misfortune, not only for the progress of anatomy but also of physiology. It is an artificial line

established by Winslow's unhappy facility of description. Between anatomy and physiology has been left a no man's land and yet one of great importance to medical men. I refer especially to the muscular mechanisms of the body—the mechanism of respiration, circulation, digestion, deglutition, micturition, and locomotion, subjects at present indifferently taught and indifferently understood, because the man who teaches the action has forgotten the structures that are involved, and the man who describes and knows the structures has not troubled to discover how they act. In our school, as in many others throughout the country, the gap between anatomy and physiology, which tends to widen, has not been felt because of the harmonious workings of the two departments, yet I think the time has come when a reconsideration of the present dividing line is necessary in the interests of all concerned.

There are many reasons that make a reconsideration of the present scope of anatomy urgent. There is, in the first place, the enormous growth of physiology; already those that teach that subject find its present scope beyond the powers of one teacher. There is, in the second place, the necessity of finding more time for the subjects absolutely essential to the profession of medicine—the old but ever-growing subjects of medicine, surgery, and midwifery; the newer subjects—pathology, bacteriology, pharmacology, hygiene, and special diseases. Something has to be unloaded to make proper room for those, and we anatomists, who like thrifty housewives have treasured everything, have to unload our share and, for my part, I will willingly let go much of that material we dragged ashore in our close-meshed descriptive net. If to the splendid basis of descriptive anatomy we have now at our disposal we were to add the practical spirit of the eighteenth century anatomists I feel certain we should secure a future of great prosperity for anatomy.